

REMARKS

Claims 13-21 are pending in this application. By this Amendment, claims 1-12 and 22-24 are canceled without prejudice to or disclaimer of the subject matter recited therein, and claims 13-21 are amended. No new matter is added. Reconsideration in view of the foregoing amendments and the following remarks is respectfully requested.

Applicants appreciate the courtesies shown to Applicants' representatives by Examiner Kim in the October 19, 2005, personal interview. Applicants' separate record of the substance of the interview is incorporated into the following remarks.

The Office Action objects to claims 3 and 4. This objection is moot because claims 3 and 4 are canceled by the Amendment.

The Office Action objects to claims 13-16 asserting that claims 13-16 use potentially confusing terminology. Claims 13 and 14 are amended for greater clarity to obviate the objection.

The Office Action also states that in some definitions, the inner and outer casings are part of the "combustion chamber." Applicants respectfully disagree with this statement.

Applicants respectfully submit that, although the combustion chamber 12, the combustion chamber inner casing 18, and the combustion chamber outer casing 16 structure define a "combustion section," the combustion chamber inner casing 18 and the combustion chamber outer casing 16 are distinct from the combustion chamber 12 as clearly shown in Fig. 1 and described in the specification at, for example, page 8, lines 3-18. Therefore, the reader of the specification would understand without confusion that the combustion chamber inner casing 18 and the combustion chamber outer casing 16 are not the part of the combustion chamber 12. Thus, the term defines the inner region where combustion takes places.

At least for these reasons, withdrawal of the objection is respectfully requested.

Claims 13-21 are amended for greater clarity and to correct informalities.

The Office Action rejects claims 1-3, 12 and 22 under 35 U.S.C. §102(b) over GB 2288600. This rejection is moot because claims 1-3, 12 and 22 are canceled by the Amendment. Withdrawal of the rejection is respectfully requested.

The Office Action rejects claims 20 and 21 under 35 U.S.C. §102(b) over U.S. Patent No. 2,807,931 to Bodine, Jr. (Bodine). This rejection is respectfully traversed.

Claim 20 recites that the damping tube extends into the interior of the combustion chamber.

Bodine, on the other hand, discloses two Helmholtz resonators 150 and tubes connected to the respective resonators 150 in Fig. 6. As described in Bodine at col. 8, line 76-col. 9, line 2, the resonators 150 are mounted in the rear end of a pod 133, and their necks open through the curved rearward end of the pod 133. However, Bodine does not specifically teach or suggest that the tubes extend into the interior of the combustion region 140, which is located remote from the resonators.

During the personal interview, Examiner Kim asserted that the space between the combustion region 140 and the end wall of the pod 133 could be considered a part of the combustion chamber. However, as described at col. 8, lines 52-53, a flame holding grill 146 is positioned just beyond the fuel nozzles 141, and, as shown in Fig. 7, creates a wall-like partition, which separates the combustion region 140 from the area between the end wall of the pod 133 and the frame holding grill 146. Therefore, one of ordinary skill in the art would understand the "combustion chamber" corresponds to the "combustion region 140" on the rear side (to the right side of Fig. 6) of the flame holding grill 146. As such, Bodine does not teach or suggest that the damping tube extends into the interior of the combustion chamber, as recited in claim 20.

Claim 20 also recites that a plurality of resonators are spaced around an inner circumference of the combustion chamber with the respective cavities of diametrically opposed resonators having substantially different volumes. As shown in Applicants' Fig. 2, the resonators 38 are provided around the inner circumference of the combustion chamber 12.

During the interview, Examiner Kim asserted that the resonators 150 shown in Fig. 6 of Bodine are "circumferentially spaced around the combustion chamber" because the resonators 150 are within the housing 130. Applicants respectfully disagree with the Examiner's assertion because the resonators 150 are not provided in an area surrounded by the combustion chamber as shown in Fig. 2 of Applicants' drawings. However, the Examiner suggested clarifying the location of the resonators. As suggested by the Examiner, claim 20 is amended. However, Applicants respectfully submit that the amendment does not affect patentability of the claim because it is believed that the original recitation has such meaning, and therefore the amendment is non-narrowing. Claim 20 now explicitly states that the resonators are spaced around an inner circumference of the combustion chamber.

Accordingly, Applicants respectfully assert that Bodine does not teach or suggest that the resonators are spaced around the inner circumference of the combustion chamber as claimed.

Accordingly, claim 20 is patentably distinct from Bodine.

Claim 21 is allowable at least for its dependence on allowable claim 20, as well as for the additional features it recites.

As such, withdrawal of the rejection is respectfully requested.

The Office Action rejects claims 13-15 under 35 U.S.C. §102(e) over U.S. Patent 6,370,879 to Stalder et al. (Stalder). This rejection is respectfully traversed.

Claim 13 recites, *inter alia*, that at least one resonator has a cavity and a damping tube and is supported independently of a combustion chamber. As described in the specification

at, for example, page 9, lines 9-16, and described during the interview, supporting the resonator independently of the combustion chamber provides an advantage that substantially no load is transferred to the combustion chamber during the engine operation.

Stalder, on the other hand, does not teach or suggest this feature. As discussed during the interview, an embodiment shown in Fig. 1 (see col. 3, lines 48-55) of Stalder teaches that a conically designed mixing region 2 directly adjoins a combustion chamber 1, and that a Helmholtz resonator 4 is directly provided at the tip of the mixing region 2 via a feed line 3 and is connected via an open volume to the mixing region 2 and the combustion chamber 1. Col. 2, lines 14-16 describes that the Helmholtz resonator is directly connected to the combustion chamber via the mixing region. Further, Stalder does not teach or suggest a specific way to mount the resonator 4. Thus, Stalder does not anticipate the resonator 4 being supported independently of the combustion chamber 1, as recited in claim 13.

Stalder also teaches at col. 4, line 29 that the resonator 4 can be provided outside the casing. However, as discussed during the interview, these arrangements also do not clearly and specifically disclose an independently-supported resonator as recited in claim 1. This is particularly the case where there is no discussion of problems with direct mounting.

During the October 19 interview, Examiner Kim asserted that pieces shown at the intersection between the resonator 4 and the casing 7 are for mounting and thus that Stalder teaches independent mounting of the resonator 4. However, as discussed during the interview, Stalder does not describe what the pieces are but merely states, "the exemplary embodiment according to Fig 3 provides for the arrangement of the Helmholtz resonator 4 outside the casing 7." Nothing teaches a mounting that is independent. The only motivation for such a feature is impermissible hindsight. Therefore, Applicants respectfully submit that Stalder does not anticipate the independent supporting of the resonator, as recited in claim 13.

In addition, Stalder does not recognize the advantage of supporting the resonator independently of the combustion chamber, as recited in claim 13.

As such, Applicants respectfully submit that Stalder does not anticipate, teach or suggest this feature.

Claim 13 also recites that a damping tube extends into the interior of the combustion chamber. Stalder does not specifically teach or suggest a damping tube, but teaches at col. 2, lines 55-59 that damping behavior of the Helmholtz resonator also acts directly on the action of the additional pilot-gas feed 5. Stalder discloses various forms of the pilot-gas feed 5. However, none of them extend into the interior of the combustion chamber 1.

During the interview, Examiner Kim asserted that the mixing region 2, which is directly connected to the combustion chamber 1, may be considered as a damping tube. However, Stalder teaches at col. 3, lines 56-59 that the acoustic waves produced in the interior of the combustion chamber 1 or the mixing region 2 may be specifically damped by means of a suitable Helmholtz resonator 4 tuned to the resonance behavior of the burner. Therefore, the mixing region 2 of Stalder does not have an effect of damping, but produces acoustic waves. Thus, Applicants respectfully submit that the mixing region 2 cannot be considered as a damping tube.

Thus, at least for the above reasons, Applicants respectfully submit that claim 13 is patentably distinct from the applied art.

Claim 14 recites that the resonator is supported independently of the combustion chamber by a combustion chamber inner casing or a combustion chamber outer casing, and that the damping tube extends into the interior of the combustion chamber. Similar to the above discussions with respect to claim 13, Applicants respectfully submit that Stalder does not teach or suggest these features. Accordingly, Applicants respectfully assert that claim 14 is patentably distinct from the applied art.

Claim 15 is allowable at least for its dependence allowable claim 14, as well as for the additional features it recites. For example, claim 15 recites the resonator is supported by the combustion chamber outer casing with the resonator positioned on the radially outer side of the combustion chamber or supported by the combustion chamber inner casing with the resonator positioned on the radially inner side of the combustion chamber. Stalder does not teach or suggest the orientation of the resonator 4 with respect to the combustion chamber 1.

At least for the above reasons, Applicants respectfully request withdrawal of the rejection.

The Office Action rejects claims 22 and 23 under 35 U.S.C. §103(a) over GB 2288600. This rejection is moot because claims 22 and 23 are canceled by the Amendment. As such, withdrawal of the rejection is respectfully requested.

The Office Action rejects claims 1-12 under 35 U.S.C. §103(a) over GB 2288600 in view of U.S. Patent No. 4,786,188 to Myrhe et al. and/or U.S. Patent No. 6,354,733 to Glasheen et al. This rejection is moot because claims 1-12 are canceled by the Amendment. As such, withdrawal of the rejection is respectfully requested.

The Office Action rejects claims 20 and 21 under 35 U.S.C. §103(a) over Bodine. The Office Action applies Bodine's embodiment, shown in Fig. 2, in view of the embodiment shown in Fig. 6. The Office Action admits that the Fig. 2 embodiment does not teach or suggest multiple Helmholtz resonators but alleges that the Fig. 6 embodiment does. This rejection is respectfully traversed.

As described above, claim 20 recites, *inter alia*, that the damping tube extends into the interior of a combustion chamber.

The Fig. 2 embodiment does not show the tube from the resonator 71. As described above, the Fig. 6 embodiment does not teach or suggest this feature. Therefore, Bodine does

not teach or suggest that the damping tube extends into the interior of a combustion chamber, as recited in claim 20.

Moreover, as discussed above, claim 20 recites that a plurality of resonators are spaced around the inner circumference of the combustion chamber.

As shown in Fig. 6, Bodine does not teach or suggest that the resonators are spaced around the inner circumference of the combustion chamber.

Therefore, Applicants respectfully submit that claim 20 is patentably distinct from the applied art.

Claim 21 is allowable at least for its dependence on allowable claim 20, as well as for the additional features it recites.

At least for the above reasons, Applicants respectfully request withdrawal of the rejection.

The Office Action rejects claims 17-21 under 35 U.S.C. §103(a) over U.S. Patent No. 5,373,695 to Aigner et al. (Aigner) in view of Bodine. This rejection is respectfully traversed.

Claim 17 recites, *inter alia*, the resonator is at least partially enclosed within a cavity provided between the combustion chamber inner casing and a windage shield on a radially inner side of the casing. As described in the specification at, for example, page 9, line 31- page 10, line 7, the windage shield functions to reduce windage losses between a resonator and the high pressure engine shaft when it rotates about the engine axis. The windage shield also functions to provide a containment structure in the event of mechanical failure of any one of the resonators.

The Office Action admits that Aigner does not teach or suggest this feature but asserts that Bodine teaches that the resonator 71 appears to be in a windage area. Bodine teaches at col. 6, lines 23-24 that a resonator 71 is mounted in an opening through duct wall 52. However, Bodine does not clearly state that the resonator 71 is provided between the

combustion chamber inner casing and a windage shield. The Office Action's assertion of "appear to be" is an opinion and is not based on specific teaching of the applied reference. Therefore, it is not proper basis for the *prima facie* case of obviousness.

During the interview, Examiner Kim asserted that the duct wall 52 functions as the windage shield. However, even so, the resonator 71 of Bodine is not partially enclosed within a cavity provided between the combustion chamber inner casing and the duct wall 52. That is, the duct wall 52 does not form a part of enclosure that encloses the resonator 71. Therefore, one of ordinary skill in the art would not have been motivated to incorporate unenclosed resonator 71 of Bodine into the area surrounded by the ring 33 and the ring shell 39. Moreover, neither Aigner nor Bodine recognizes the functions of a windage shield. Therefore, such a modification would have to rely on the hindsight knowledge gained from Applicants' disclosure.

Hence, Applicants respectfully submit that claim 17 is patentably distinct from the applied art.

Claims 18 and 19 are allowable at least for their dependence on allowable claim 17, as well as for the additional features they recite.

Claim 20 recites that the damping tube extends into the interior of the combustion chamber, and that the plurality of resonators is spaced around the inner circumference of the combustion chamber with the respective cavities of diametrically opposed resonators having substantially different volume. The Office Action asserts that Bodine teaches these features.

However, as described above, Bodine does not teach or suggest these features. In addition, the Office Action states that Bodine teaches the use of multiple Helmholtz resonators 150 which are diametrically opposed and having different volumes and successively smaller volumes. Applicants respectfully submit that because Bodine only teaches the use of two resonators, one of ordinary skill in the art would not have been

motivated to combine Bodine with Aigner, who teaches more than two resonators. Even if combined, one of ordinary skill in the art would not have been motivated from the disclosure of Bodine to provide the plurality of resonators spaced around the inner circumference of the combustion chamber with the respective cavities of diametrically opposed resonators having substantially different volume, as recited in claim 20, because Bodine does not teach or suggest how the resonators having different volumes should be arranged. To do so must rely on the hindsight knowledge gained from the Applicants' disclosure. As such, claim 20 is patentably distinct from the art.

Claim 21 is allowable at least for its dependence on allowable base claim 20, as well as for the additional features it recites.

At least for these reasons, Applicants respectfully request withdrawal of the rejection.

The Office Action rejects claim 24 under 35 U.S.C. §103(a) over any of the above-applied art in view of U.S. Patent No. 6,530,221 to Sattinger et al. This rejection is moot because claim 24 is canceled by the Amendment. As such, withdrawal of the rejection is respectfully requested.

The Office Action rejects claims 13-15 under 35 U.S.C. §103(a) over U.S. Patent No. 5,682,157 to Pandalai et al. (Pandalai) in view of Bodine. This rejection is respectfully traversed.

Claim 13 recites that the Helmholtz resonator has a cavity and a damping tube in flow communication with the interior of the combustion chamber and that the damping tube extends into the interior of the combustion chamber.

The Office Action alleges that the apparatus 100 of Pandalai corresponds to the resonator with a cavity and tube. However, as discussed during the interview, the resonating tube 101 of Pandalai is not in flow communication with the interior of the combustion chamber 29 and does not extend into the interior of the combustion chamber 29, as clearly

shown in Fig. 1. The Examiner asserted that the combustor 10 as a whole corresponds to the recited combustion chamber. However, Pandalai specifically teaches a combustion chamber 29; therefore, one of ordinary skill in the art would not have viewed the combustor 10 as the "combustion chamber."

Moreover, Pandalai does not teach or suggest a Helmholtz resonator but discloses a quarter wave resonator. Applicants respectfully submit that one of ordinary skill in the art would recognize such a quarter wave resonator does not impose the same structural loads as a Helmholtz resonator. As such, claim 13 is patentably distinct from the applied art.

Claim 14 recites features similar to those of claim 13. Accordingly, claim 14 is patentably distinct from the applied art. Claim 15 is allowable at least for its dependence on allowable claim 14, as well as for the additional features it recites.

As such, at least for the reasons discussed above, Applicants respectfully request withdrawal of the rejection.

The Office Action rejects claims 13-21 under 35 U.S.C. §103(a) over U.S. Patent No. Aigner and Bodine, in view of any one of Pandalai, U.S. Patent No. 3,982,392 to Crow and Stalder. This rejection is respectfully traversed.

First, during the interview, Examiner Kim clarified that "Tegel et al." appearing in the Office Action is an error and should be Crow.

Applicants respectfully submit that Aigner teaches a combustion chamber in which, as with Stalder, the damping means are bolted directly to the combustion chamber. Such a design is suited to land-based industrial gas turbine engines, where weighty combustion chambers can be used to support the loads imposed. However, such a design is not suitable for aero-engine applications, as described in the specification at, for example, page 1, paragraph 4. None of the other applied art teaches that direct attachment is a problem.

Bodine teaches a Helmholtz resonator in indirect flow communication with the combustion chamber. As described above, Bodine does not specifically teach or suggest how the resonator is mounted.

Pandalai does not teach or suggest a Helmholtz resonator but discloses a quarter wave resonator. As discussed above, one of ordinary skill in the art would recognize that such a quarter wave resonator does not impose the same structural loads as a Helmholtz resonator. Furthermore, Applicants respectfully submit that, although the resonator is attached to the engine casing, the resonator is not in direct flow communication with the combustion chamber as discussed above.

As discussed above, Stalder does not specifically teach or suggest supporting the resonator independently of the combustion chamber.

Crow does not teach or suggest a use of resonator. During the interview, Examiner Kim indicated the use of Crow is for the teaching of an igniter that is mounted independently of the combustion chamber. As with quarter resonators, igniters do not impose significant structural loads, and one of ordinary skill in the art would not have looked to Crow for modifying other applied art.

Applicants respectfully submit that none of the applied prior art recognizes that direct mount of a Helmholtz resonator is a problem. Applicants respectfully submit that none of the applied art teaches or suggests a Helmholtz resonator supported independently of the combustion chamber, which is in direct flow communication with the combustion chamber volume.

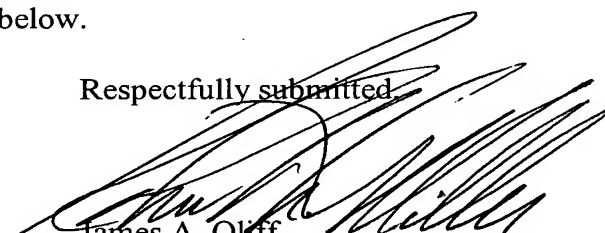
Furthermore, Applicants respectfully submit that a person skilled in the art would not have been motivated to first remove the Helmholtz resonator from the combustion chamber of Aigner, to second attach the resonator to an engine casing, and to then adopt means to provide direct flow communication with the combustion chamber volume. The Office Action

alleges various motivations for combining multiple references. However, the alleged motivations are not specifically taught or suggested by the references, and to do so must rely on hindsight knowledge gained from Applicants' disclosure. As such, Applicants respectfully submit that the rejection is improper.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 13-21 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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